



JUNE 8–11

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U.S. DEPARTMENT OF
ENERGY



Best of the Betters: 2020 Better Project and Better Practice Presentations

Wednesday, June 10
11:00 am-12:30 pm ET



Marco Gonzalez

Waupaca Foundry

Submit Questions
www.slido.com event code **#bbsummit**
then go to room **“Best of the Betters”**



A Hitachi Metals Group Company

Cupola Blast Air Dehumidification System

Marco Gonzalez, CEM
Waupaca Foundry, Inc.
Corporate Energy Manager

Who we are

Waupaca Foundry, a Hitachi Metals Group company, produces best-in-class gray iron, ductile iron, austempered ductile iron and compacted graphite iron castings at seven, strategically located state-of-the-art foundries in North America.



Automotive



Commercial
Trucks



Off Highway
Vehicles



Industrial
Applications

Waupaca Foundry, Inc. – Sustainability Goals 2020



Reduce energy intensity by
25%



Reduce spent foundry sand
generation by **30%**



Reduce Water use
consumption by **80%**



Maintain cutting edge air
pollution control technologies



Tell City, IN – Plant 5



- Footprint: 560,000 square feet
- Employees: 956
- Melting Capacity: 160 tons per hour
(at two cupolas 80 tons/hr each)
- Casting capacity: 450,000 tons annually

DH Project implemented in Cupola 5.1 Gray Iron

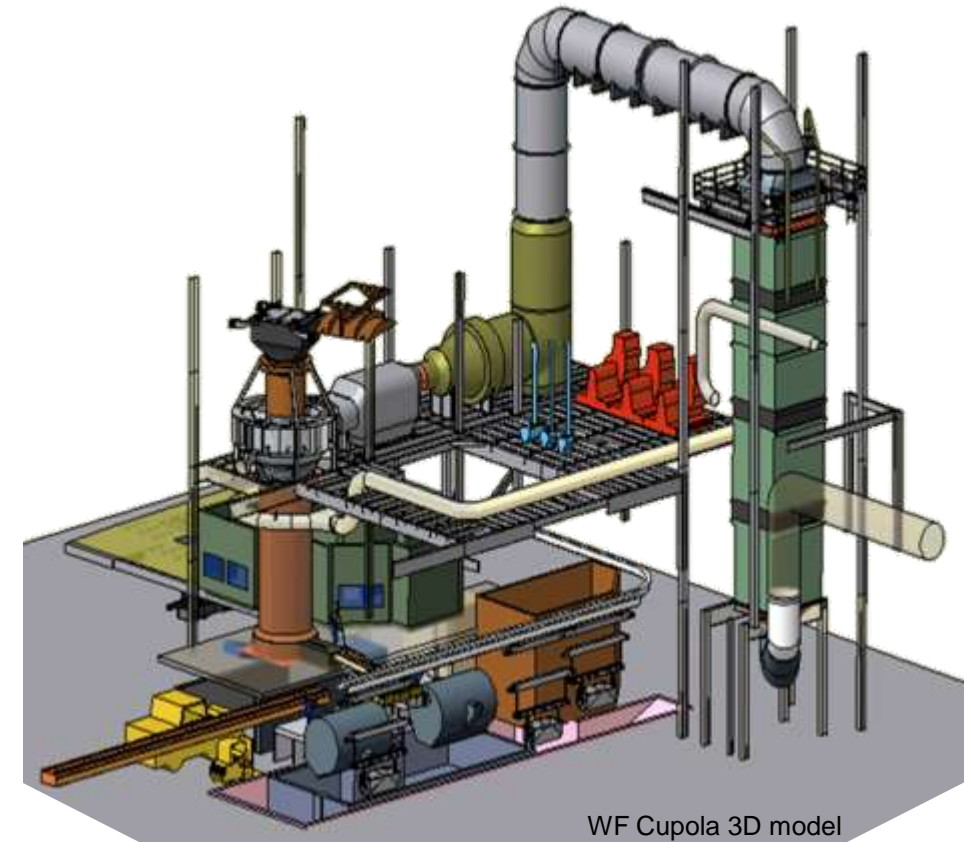
Portfolio, Gray & Ductile Iron:

Brake rotors and drums, brake calipers, crankshafts, differential carriers, differential cases, and flywheel housings



Waupaca Foundry, Inc. – Melting Facts

- Waupaca Foundry, Inc. melts over **10,000 tons per day** at seven locations. 80% is melted using Cupolas.
- A **Cupola Furnace** consists of a vertical steel shell, lined with a refractory brick. The charge consists of alternate layers of scrap metal, coke as an additive and fuel, and limestone flux.
- The coke is consumed in air which is introduced by the blast air blowers and oxygen injection through the tuyeres.
- The hot gases generated in the melt zone ascend and preheat the descending charge. A recuperative design allows waste heat recovery from the cupola for other applications.
- At Cupola plants, melt equipment represents ~70% of the total energy consumption of the plant.
- Coke supplies 50% of the energy consumed at Waupaca Foundry, Inc.
- Waupaca Foundry, Inc. is continuously implementing actions to improve the melting efficiency at its plants.



Humidity Impact on Cupola Blast Air

High humidity in cupola blast air has **detrimental effects** on cupola efficiency,

- X Increased coke rate per unit of iron melted.
- X Reduced combustion temperatures.
- X Reduced carbon pickup (coke also provides C to the iron)
- X Elevated thermal oil heat loads increasing exhaust volume to the emission control system.

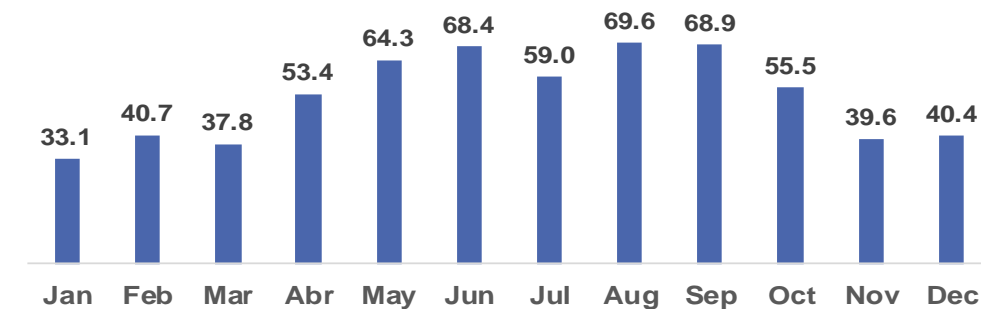
When water vapor is “burned” in the cupola combustion zone at 4,000°F, the water is dissociated into elemental Hydrogen and Oxygen. The strong reducing effect of the hydrogen causes the oxygen to react with Coke in a reduction process, consuming coke and generating carbon monoxide.

CO and H levels in the cupola gas become elevated causing a highly endothermic reaction that consumes heat and decreases the efficiency of the coke combustion.

This drop in efficiency increases the overall coke demand while reducing the cupola melt rate.



Average Monthly Dew Point (°F) - Tell City, IN



SOLUTION: Installing a Cupola Blast Air Dehumidification System

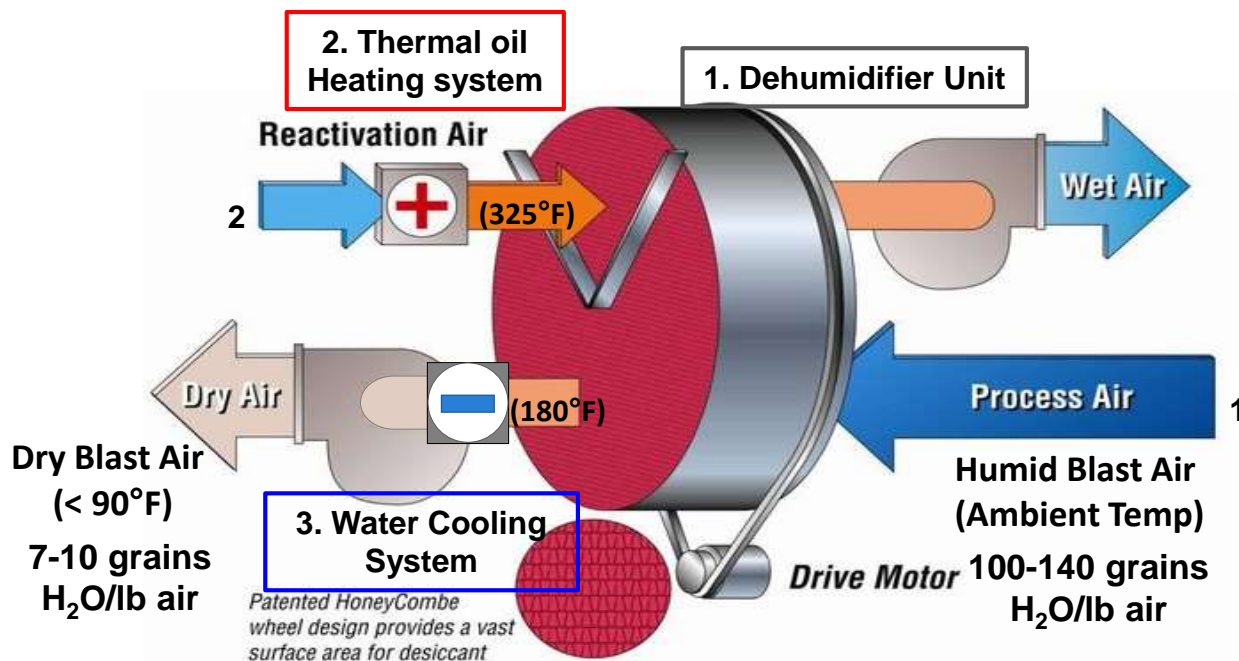
WF ENERGY STRATEGY # 2: IMPROVING PRODUCTION PROCESSES

Project developed in partnership with cupola manufacturer and dehumidifier manufacturer.

Project Timeline: 14 months. Payback 3.8 years



- 1. The Dehumidifier Unit:** A rotating desiccant wheel divided into two sections with a seal between these two sections. On one side, the ambient **process blast air** to be dehumidified is drawn through the desiccant wheel, and the moisture in the air is absorbed by the desiccant wheel. On the other side, the absorbed moisture in the wheel is removed with heated regenerative air section.
- 2. Thermal Oil Heating System,** from the cupola waste heat recovery system, provides the heat required to reactivate the desiccant wheel.
- 3. Water Cooling System,** using cupola process cooling water, reduces the blast air temp before the blower.



Benefits



+3% CUPOLA
MELTING
EFFICIENCY

16,728 MMBTU
ENERGY SAVINGS
1% PLANT'S ENERGY USAGE

\$ 335,000
ENERGY COST SAVINGS
Project Timeline: 14 months
Payback 3.8 years

-2.5% COKE REDUCTION
656 Tons

1,804 t-CO₂
AVOIDED – 1% PLANT'S GHG

The water vapor removed is equivalent to

126,757 gallons
of Water removed
from blast air

=



1 Keg = 15.5 Gallons

8,178
Kegs of Beer

=

21x



1 Water Truck
6,000 Gallons



A white hard hat with the Waupaca logo is positioned in the foreground on a metal surface. The background shows a blurred industrial environment with yellow overhead cranes and various machinery.

thank you

Marco Gonzalez

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Waupaca Foundry, Inc.

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